

ROT OF DATE FRUIT¹

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(WITH FIVE FIGURES)

In the autumn of 1917, Dr. A. E. VINSON of the Arizona Experiment Station brought to the writer a small box of dates from the Yuma date orchard with the request that the organism with which they were badly infected be determined. The fruits were carefully examined, but it was impossible to give the requested information without further investigation; and it was suggested by Professor THORNER, Botanist of the Station, that since the problem concerned food conservation it would be especially profitable to attack it at once. The advice was acted upon, and the results are partly set forth in this preliminary paper.

For the purpose of observing the disease in the field, a trip was made to the orchard in December 1917, and a careful inspection of trees and fruit was undertaken. A glance at the figures will show that abundant evidence of disease was not difficult to find. The ground under many of the trees was thickly covered with the spoiled fruit (fig. 1), and numerous clusters still hanging to the trees suggested a severe attack of "plum pockets," for a large percentage of the fruit had become mummified (fig. 2). Some of the fruit on the ground was covered with molds, and similarly infected fruit was found wedged between the leaf bases and tree trunks and on the ground half buried in the soil. Of the several varieties of date palms comprising the orchard, the Deglet Noor appeared to be the favorite host. It was stated that the year had been an especially bad one, about 90-95 per cent of the crop being infected. The fruit was selling at the orchard at 35-45 cents per pound. Since many of the trees produce from 200 to 400 pounds of salable fruit under normal conditions, the loss was considerable.

Both Yuma and Tempe date orchards were affected much less by the rot in 1918 than in 1917. Table I gives precipitation and

¹ Preliminary paper.



FIG. 1.—Deglet Noor variety showing ravages of date rot disease; note mummies still hanging to tree and on ground.

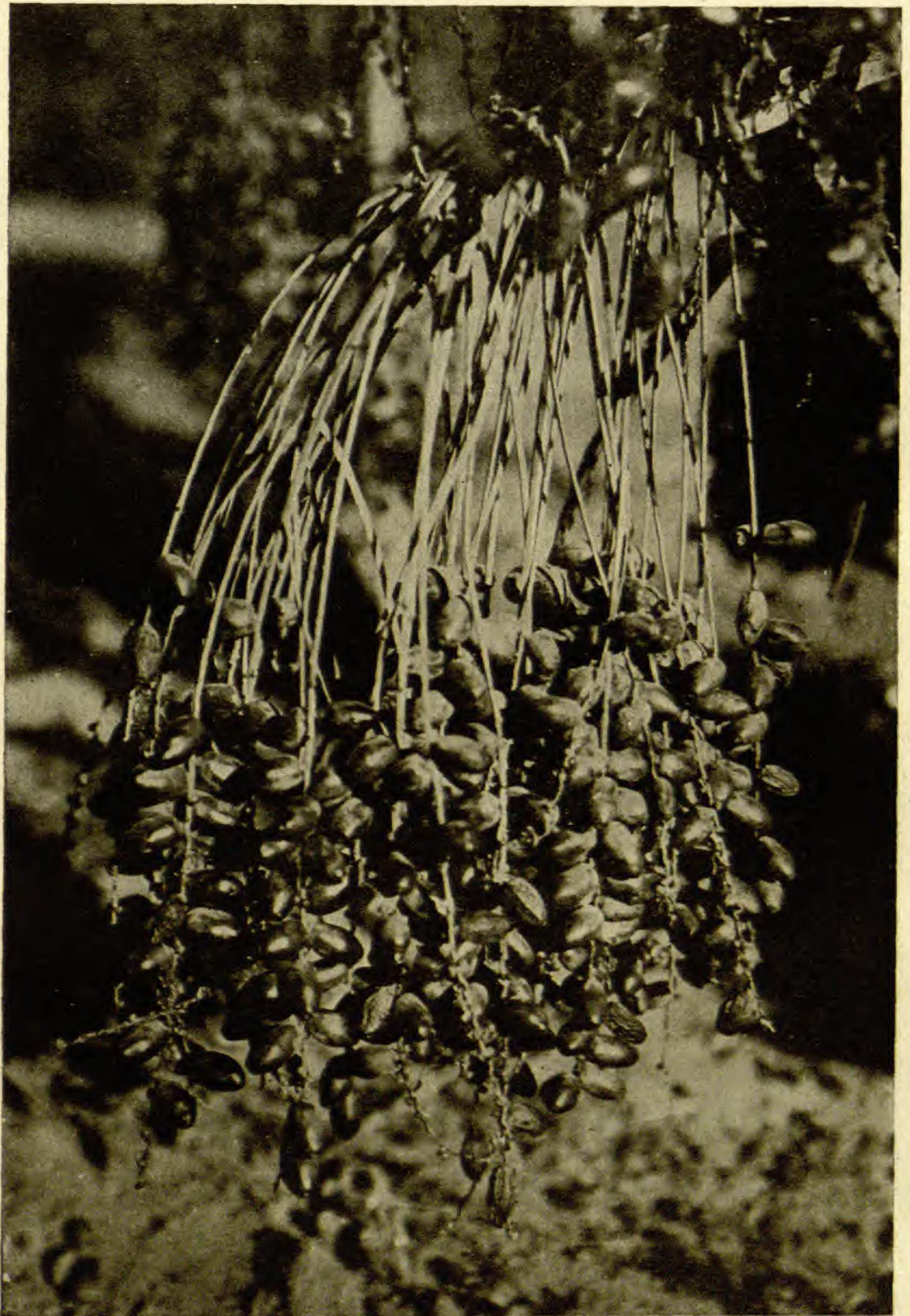


FIG. 2.—Various stages of date rot and mummification

temperature data for the Yuma date orchard covering the two years. Table I suggests that the greater prevalence of the fungi concerned in the rot of the date fruit in 1917 was possibly due to the more favorable conditions of moisture and temperature during April, May, and June, while flowering and fruit setting were in progress. From observations it appears probable that infection occurs at that time. The spring and summer of 1917 had not only an excess of moisture over the same period of 1918, but were also cooler, so that this additional moisture was more effective.

SYMPTOMS.—The fruits showed two main symptoms. Some were flecked with rusty brown spots from the size of a pinhead to areas almost covering one side of the fruit (fig. 4); others showed soft spots varying in size and partly translucent, as though soaked with water or oil (fig. 5). The brown spots gradually increased in size, often coalescing, forming a dark chocolate margined area oval in outline, with depressed, light cream or grayish centers on which clusters of spores finally appeared in pustules (fig. 4, third fruit, third row). The soft spots also enlarged to a similar extent, giving an appearance of rot. In both cases the ruptured epidermis allowed excessive water loss, resulting in the final mummy stage. Mummified fruits sometimes remained for a time in situ, but sooner or later fell to the ground (figs. 1 and 3). The exposed sweet pulp, in the early stages of the soft spots, attracted swarms of small flies and other insects which hovered in and around the fruit clusters, and probably aided materially in carrying the infection.

Examination of the trees revealed numerous brown spots on petioles and ribs of leaves, which also extended down the rhachi of fruit clusters. This suggested a relation between fruit spot and leaf spot, which appears to be confirmed by the laboratory experiments so far completed. In the Tempe date orchard palms three years old already showed the brown spots on the leaf bases.

LABORATORY STUDIES.—Cultures have been made from the spots on leaves, rhachi, and fruits collected in both orchards. The medium used was date agar, prepared according to the method described by SHEAR and STEVENS² for prune agar by substituting

² SHEAR, C. S., and STEVENS, N. E., Bur. Pl. Ind. Circ. no. 131.



FIG. 3.—Cluster of date fruit from left side of tree shown in fig. 1, showing most of fruit fallen, owing to attack of spot and rot fungi.

TABLE I

	January	February	March	April	May	June	July	August	September	October	November	December
Comparative precipitation 1917												
Precipitation in inches.....			00	0.27	0.05	00	0.93	0.24	0.18	00	00	00
Departure from normal.....			-0.26	+0.20	+0.05	-0.06	+0.59	-0.64	+0.09	-0.24	-0.27	-0.41
1918												
Precipitation in inches.....	0.62	0.15	0.63	00	00	00	00	0.39	00	0.15	0.12	0.27
Departure from normal.....			+0.37	-0.07	00	00	-0.34	-0.49	-0.09	-0.09	-0.15	-0.14
Comparative temperatures 1917												
Temperature.....	53.3		59	65.7	69.2	81.2	88.4	86.6	84.2	74.4	60.3	56.6
Departure from normal.....			-1.5	+0.01	-1.5	+2.8	+2.4	+0.5	+4.9	+6.2	+1.5	+6.3
1918												
Temperature.....	53.3	56.7	64.8	68.4	71.8	86.2	87.9	83.7	73.6	58.6	51.6
Departure from normal.....	+1.6	+1.1	+4.3	+2.8	+1.2	+7	+1.9	+3.7	+4.5	-0.3	+ .7



FIG. 4.—Progressive stages in mummification of date fruit, due to spot fungus; spots rusty brown at first, then dark chocolate to black, margined with lighter

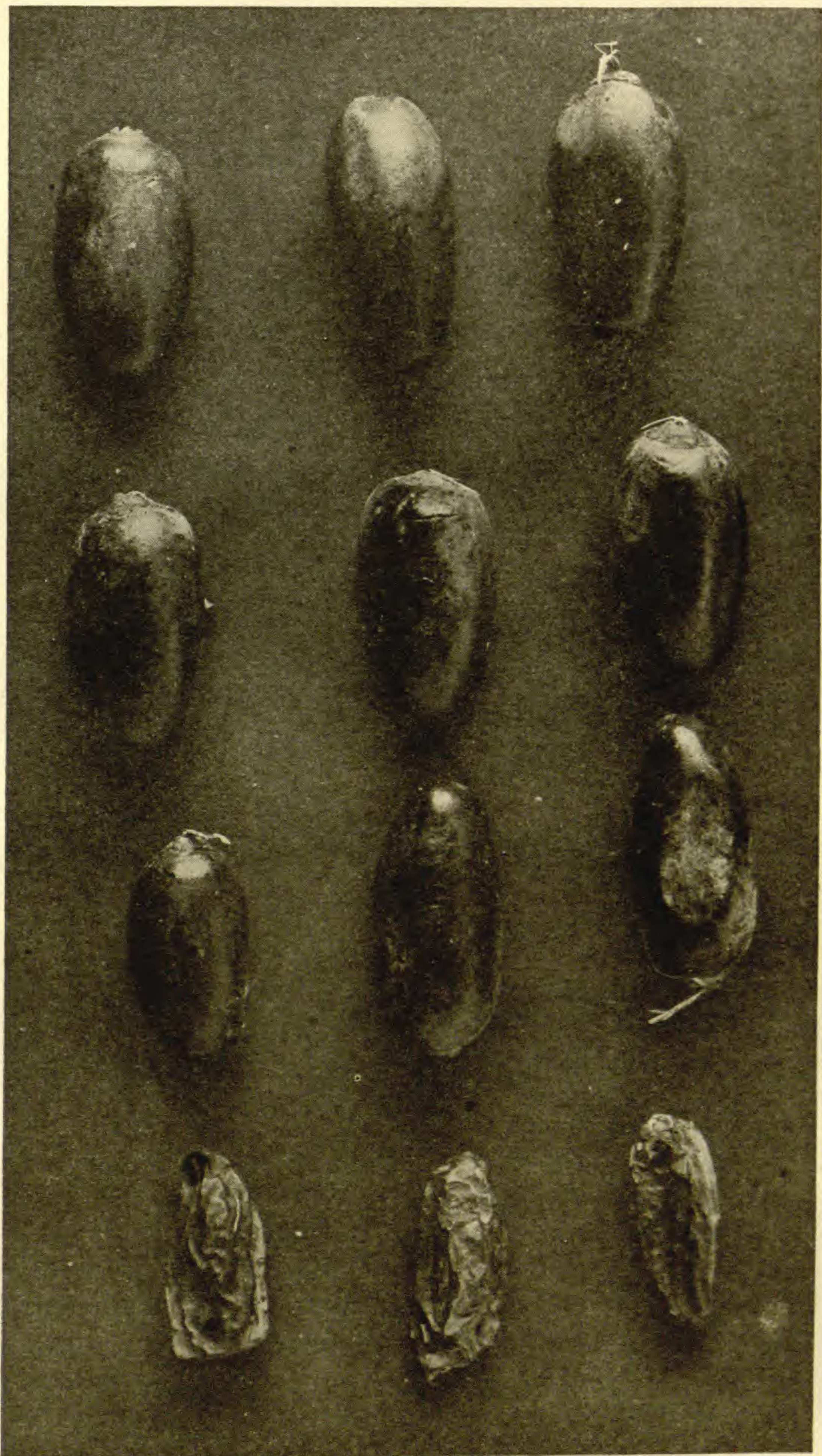


FIG. 4.—Progressive stages in mummification of date fruit, due to spot fungus; spots rusty brown at first, then dark chocolate to black, margined with lighter depressed centers.

dates for prunes. Infected spots in all three situations gave typical *Alternaria* spores similar to those found in pustules. Besides this fungus, two species of *Aspergillus* and one species of



FIG. 5.—Stages in rotting and drying out following attack of *Alternaria*, *Aspergillus*, and *Penicillium*, showing spots having a water-soaked appearance at first.

Penicillium usually appeared. The method of inoculation consisted in the removal of a block of infected tissue with a flamed scalpel after sterilization of the surface. The fungi appearing on the agar have all been isolated and grown in pure culture. On old